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(54) Title: METHOD FOR MANUFACTURING COBALT CATALYSTS		
(57) Abstract		
<p>A method for manufacturing cobalt complexes having the formula: $[Co(NH_3)_5M]^{Ty}$ wherein M ligands are selected from substituted and unsubstituted C₁-C₃₀ carboxylic acids having the formula: RC(O)O-; said method comprising reacting cobalt complexes having the formula: $[Co(NH_3)_5X]^{Ty}$ (e.g., X is chlorine) with concentrated ammonium hydroxide followed by carboxylic acid anhydride of the formula: RC(O)O(OC)R.</p>		

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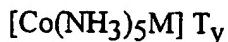
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METHOD FOR MANUFACTURING COBALT CATALYSTS

TECHNICAL FIELD

5 The present invention relates to methods for manufacturing cobalt complexes having the formula:



wherein M ligand is selected from substituted and unsubstituted C₁-C₃₀ carboxylic acids having the formula:



10 These catalysts are particularly useful in bleach-containing consumer compositions, especially automatic dishwashing detergents and laundry detergents comprising bleach.

BACKGROUND OF THE INVENTION

15 Cobalt catalysts are well known, as are a variety of methods for manufacturing them. Most synthesis methods, however, are directed simply to methods effective for obtaining experimental quantities for academic studies. These are described, for example, in M. L. Tobe, "Base Hydrolysis of Transition-Metal Complexes", Adv. Inorg. Bioinorg. Mech., (1983), 2, pages 1-94; J. Chem. Ed. (1989), 66 (12), 1043-45; The Synthesis and Characterization of Inorganic Compounds, W.L. Jolly (Prentice-Hall; 1970), pp. 461-3; Inorg. Chem., 18, 1497-1502 (1979); Inorg. Chem., 21, 2881-2885 (1982); Inorg. Chem., 18, 2023-2025 (1979); Inorg. Synthesis, 173-176 (1960); and Journal of Physical Chemistry, 56, 22-25 (1952).

20 For use in consumer products, however, it is necessary that the cobalt catalysts be prepared in large quantities by the most cost effective manner with the highest possible purity. It has been discovered by the present invention that cobalt catalysts containing carboxylate ligands can be prepared on an industrially useful scale by the present process.

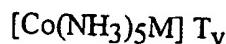
BACKGROUND ART

25 U.S. Patent 4,810,410, to Diakun et al, issued March 7, 1989; U.S. 5,246,612, to Van Dijk et al., issued September 21, 1993; U.S. 5,244,594, to Favre et al., issued September 14, 1993; and European Patent Application, Publication No. 408,131, published January 16, 1991 by Unilever NV, see also: U.S. Patent 5,114,611, to Van

Kralingen et al, issued May 19, 1992 (transition metal complex of a transition metal, such as cobalt, and a non-macro-cyclic ligand); U.S. Pat. 4,430,243, to Bragg, issued February 7, 1984 (laundry bleaching compositions comprising catalytic heavy metal cations, including cobalt); German Patent Specification 2,054,019, published October 7, 1971 by Unilever N.V. (cobalt chelant catalyst); and European Patent Application Publication No. 549,271, published June 30, 1993 by Unilever PLC (macrocyclic organic ligands in cleaning compositions).

SUMMARY OF THE INVENTION

The present invention relates to methods for manufacturing cobalt complexes having the formula:

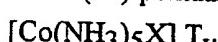


wherein the M ligand is selected from substituted and unsubstituted C₁-C₃₀ carboxylic acids having the formula:



said method comprising the steps of:

(a) reacting a cobalt (III) pentaamine complex having the formula:



wherein X is selected from base labile ligands (preferably Cl⁻, Br⁻, OH⁻, H₂O, NO₂⁻, SO₄²⁻, and CO₃²⁻); and T is one or more counteranions present in a number y, where y is an integer to obtain a charge-balanced salt (preferably y is 1 or 2);

with an aqueous base (preferably concentrated ammonium hydroxide); followed by

(b) reacting the product of step (a) with a carboxylic acid anhydride of the formula:



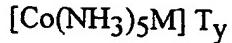
wherein each R is independently selected from substituted or unsubstituted C₁-C₃₀ moieties (preferably both R are the same); and

(c) collecting the cobalt complex.

All parts, percentages and ratios used herein are expressed as percent weight unless otherwise specified. All documents cited are, in relevant part, incorporated herein by reference.

DETAILED DESCRIPTION OF THE INVENTION

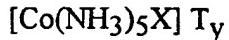
The present invention relates to a method for manufacturing cobalt complexes having the formula:



wherein the M ligands are selected from substituted and unsubstituted C₁-C₃₀ carboxylic acids having the formulas:



5 This method comprises the first step of reacting with an aqueous base a cobalt (III) pentaamine complex having the formula:



wherein X is selected from base labile ligands. Preferred X are selected from Cl⁻, Br⁻, OH⁻, H₂O, NO₂⁻, SO₄²⁻, and CO₃²⁻. T is one or more appropriately selected counteranions present in a number y, where y is an integer to obtain a charge-balanced salt (preferably y is 1 or 2). Preferred T are selected from the group consisting of chloride, nitrate, nitrite, sulfate, citrate, acetate, carbonate, bromide, PF₆⁻, BF₄⁻, phosphate, tosylate, methanesulfonate, and combinations thereof.

15 The aqueous base for this first step is preferably concentrated aqueous ammonium hydroxide (preferably at least 20%, more preferably at least 25%, and typically between 28-32% solutions). Other aqueous bases include, for example, potassium hydroxide, sodium hydroxide, and other weak amine bases.

20 Reaction conditions for this step typically require slight heating (above about 65°C) sufficient to dissolve the cobalt (III) pentaamine complex, followed by cooling to approximately room temperature prior to the next step.

This first step is followed by reacting the product of the first step with a carboxylic acid anhydride of the formula:



25 wherein each R is independently selected from substituted or unsubstituted C₁-C₃₀ moieties. It is preferred that both R moieties are the same, but mixed anhydrides may be used as desired for the desired cobalt complex being synthesized. Reaction conditions for this step are typically room temperature for from about 10 to about 60 minutes.

30 At the end of the reaction process, the cobalt complex is collected. Preferred collection methods include, for example, evaporation to remove the solvent or lyophilization. The cobalt complex collected may be used as is, or further purified or modified for incorporation into the desired product or use to be made of the complex. This includes optionally washing the solid product with ethanol to remove non-cobalt salts.

The present invention method preferably is carried out in one reaction vessel without isolation or separation of the intermediate reaction products. However, if desired, one or more of the reaction steps may be conducted in separate reaction vessels, and may be followed or preceded by optional separation and/or collection steps of the intermediate reaction materials.

Herein, R is preferably selected from the group consisting of hydrogen and C₁-C₃₀ (preferably C₁-C₁₈) unsubstituted and substituted alkyl, C₆-C₃₀ (preferably C₆-C₁₈) unsubstituted and substituted aryl, and C₃-C₃₀ (preferably C₅-C₁₈) unsubstituted and substituted heteroaryl, wherein substituents are selected from the group consisting of -NR'₃, -NR'₄⁺, -C(O)OR', -OR', -C(O)NR'₂, wherein R' is selected from the group consisting of hydrogen and C₁-C₆ moieties. Such substituted R therefore include the moieties -(CH₂)_nOH and -(CH₂)_nNR'₄⁺, wherein n is an integer from 1 to about 16, preferably from about 2 to about 10, and most preferably from about 2 to about 5.

Most preferred M are carboxylic acids having the formula above wherein R is selected from the group consisting of hydrogen, methyl, ethyl, propyl, straight or branched C₄-C₁₂ alkyl, and benzyl. Most preferred R is methyl. Preferred carboxylic acid M moieties include formic, benzoic, octanoic, nonanoic, decanoic, dodecanoic, and especially acetic acid. Therefore, most preferred methods use the anhydrides comprising these carboxylic acids, and preferred anhydrides are the same acids. Most preferred anhydride is acetic anhydride.

The most preferred cobalt complex prepared by the present invention is cobalt pentaamine acetate chloride, [Co(NH₃)₅OAc]Cl₂ (herein "PAC").

The starting cobalt (III) pentaamine complexes useful herein, the [Co(NH₃)₅X]_{Ty} complexes, are commercially available and can be prepared by a variety of methods. These include the preferred starting material [Co(NH₃)₅Cl]Cl₂, sold by Aldrich and by Pfaltz and Bauer.

The following nonlimiting example further illustrates the method according to the present invention.

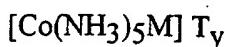
Synthesis of [Co(NH₃)₅OAc]Cl₂



[Co(NH₃)₅Cl]Cl₂ (26.4 g, 0.10 mol) is added to distilled water (800 mL). NH₄OH (23.4 mL, 0.600 mol) is slowly added with stirring. The solution is then heated to 75°C and the solid dissolves with stirring. The solution is cooled to RT. Acetic anhydride (30.6 g, 0.30 mol) is slowly added with stirring. The solution is stirred 1 hour at RT. At this point the reaction solution can either be lyophilized to a pink powder or the solution can be rotovapped down and the resulting solid pumped on overnight at 0.05 mm. to remove residual water and NH₄OAc. The excess ammonium acetate and ammonium chloride salts can also be removed by washing the solid with ethanol. Yield 35 gr., 78.1% by uv-vis spectroscopy. HPLC [according to the method of D.A. Buckingham, et al, Inorg. Chem., **28**, 4567-4574 (1989)] shows all of the cobalt is present as [Co(NH₃)₅OAc]Cl₂.

What is Claimed is:

1. A method for manufacturing cobalt complexes having the formula:

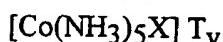


wherein the M ligand is selected from substituted and unsubstituted C₁-C₃₀ carboxylic acids having the formula:



wherein R is selected from substituted or unsubstituted C₁-C₃₀ moieties; said method comprising the steps of:

- (a) reacting a cobalt (III) pentaamine complex having the formula:



wherein X is selected from base labile ligands; and T is one or more counteranions present in a number y, where y is an integer to obtain a charge-balanced salt;

with an aqueous base; followed by

- (b) reacting the product of step (a) with a carboxylic acid anhydride of the formula:



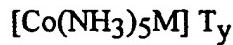
wherein each R is independently selected from substituted or unsubstituted C₁-C₃₀ moieties; and

- (c) collecting the cobalt complex.

2. The method according to Claim 1 wherein X is selected from Cl⁻, Br⁻, OH⁻, H₂O, NO₂⁻, SO₄²⁻, and CO₃²⁻.
3. The method according to either of Claims 1 or 2 wherein the aqueous base is ammonium hydroxide.
4. The method according to any of Claims 1-3 wherein each R in the anhydride is independently selected from the group consisting of hydrogen and C₁-C₃₀ unsubstituted and substituted alkyl, C₆-C₃₀ unsubstituted and substituted aryl, and C₃-C₃₀ unsubstituted and substituted heteroaryl, wherein substituents are selected from the group consisting of -NR'3, -NR'4⁺, -C(O)OR', -OR', -C(O)NR'2, wherein R' is selected from the group consisting of hydrogen and C₁-C₆ moieties.
5. The method according to any of Claims 1-4 wherein each R in the anhydride is independently selected from C₁-C₁₈ unsubstituted and substituted alkyl.

6. The method according to any of Claims 1-5 wherein the M ligand is a carboxylic acid moiety selected from formic, benzoic, octanoic, nonanoic, decanoic, dodecanoic, and preferably acetic acid.

7. A method for manufacturing cobalt complexes having the formula:



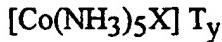
wherein the M ligand is selected from substituted and unsubstituted C₁-C₃₀ carboxylic acids having the formula:



wherein R is selected from C₁-C₁₈ unsubstituted and substituted alkyl moieties;

said method comprising the steps of:

(a) reacting a cobalt (III) pentaamine complex having the formula:



wherein X is selected from Cl⁻, Br⁻, OH⁻, H₂O, NO₂⁻, SO₄²⁻, and CO₃²⁻; and T is one or more counteranions present in a number y, where y is an integer to obtain a charge-balanced salt;

with concentrated ammonium hydroxide; followed by

(b) reacting the product of step (a) with a carboxylic acid anhydride of the formula:



wherein each R is independently selected from C₁-C₁₈ unsubstituted and substituted alkyl moieties; and

(c) collecting the cobalt complex.

8. The method according to any of Claims 1-7 wherein both R in the anhydride are the same moiety selected from the group consisting of hydrogen, methyl, ethyl, propyl, straight or branched C₄-C₁₂ alkyl, and benzyl.

9. The method according to any of Claims 1-8 wherein the anhydride is acetic anhydride.

10. The method according to any of Claims 1-5 and 7 wherein each R in the anhydride is independently selected from the moieties -(CH₂)_nOH and -(CH₂)_nNR'4⁺, wherein n is an integer from 1 to 16, preferably from 2 to 10.

KWZ (5725EPO)

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(51) International Patent Classification ⁶ : C07F 15/06, C11D 3/39		A3	(11) International Publication Number: WO 97/00128 (43) International Publication Date: 3 January 1997 (03.01.97)
<p>(21) International Application Number: PCT/US96/08662</p> <p>(22) International Filing Date: 4 June 1996 (04.06.96)</p> <p>(30) Priority Data: 08/490,699 16 June 1995 (16.06.95) US</p> <p>(71) Applicant: THE PROCTER & GAMBLE COMPANY [US/US]; One Procter & Gamble Plaza, Cincinnati, OH 45202 (US).</p> <p>(72) Inventor: PERKINS, Christopher, Mark; 7230 Fembank Avenue, Cincinnati, OH 45233 (US).</p> <p>(74) Agents: REED, T., David et al.; The Procter & Gamble Company, 5299 Spring Grove Avenue, Cincinnati, OH 45217 (US).</p>			<p>(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p> <p>(88) Date of publication of the international search report: 17 April 1997 (17.04.97)</p>

(54) Title: **METHOD FOR MANUFACTURING COBALT CATALYSTS**

(57) Abstract

A method for manufacturing cobalt complexes having the formula: $[Co(NH_3)_5M] T_y$ wherein M ligands are selected from substituted and unsubstituted C₁-C₃₀ carboxylic acids having the formula: RC(O)O⁻; said method comprising reacting cobalt complexes having the formula: $[Co(NH_3)_5X] T_y$ (e.g., X is chlorine) with concentrated ammonium hydroxide followed by carboxylic acid anhydride of the formula: RC(O)O(O)CR.

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INTERNATIONAL SEARCH REPORT

International Application No PCT/US 96/08662

A. CLASSIFICATION OF SUBJECT MATTER	
IPC 6	C07F15/06 C11D3/39

According to International Patent Classification (IPC) or to both national classification and IPC	
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B. FIELDS SEARCHED	
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Minimum documentation searched (classification system followed by classification symbols)	
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IPC 6	C07F C11D
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched	
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Electronic data base consulted during the international search (name of data base and, where practical, search terms used)	
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C. DOCUMENTS CONSIDERED TO BE RELEVANT	
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Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>INORGANIC CHEMISTRY, vol. 18, no. 6, 1979, EASTON US, pages 1497-1502, XP002018152 L.M. JACKMAN: "Synthesis of Transition-Metal Carboxylato Complexes" cited in the application see particularly page 1498, right-hand column, paragraph (ii)</p> <p>---</p> <p>GB 3 034 061 A (FUJI PHOTO FILM CO.) 29 May 1980 see particularly page 6, synthesis example 4</p> <p>---</p> <p>---</p> <p>-/-</p>	1-10
A		1-10

<input checked="" type="checkbox"/>	Further documents are listed in the continuation of box C.
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<input checked="" type="checkbox"/>	Patent family members are listed in annex.
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Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

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Date of the actual completion of the international search

6 March 1997

Date of mailing of the international search report
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13 -03- 1997

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Beslier, L

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 96/08662

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>INORGANIC CHEMISTRY, vol. 21, no. 7, 1982, EASTON US, pages 2881-2885, XP002018153 THOMAS J. WIERENGA: "Synthesis and Characterization of Cobalt(III) Nicotinic Acid Complexes" cited in the application see the whole document -----</p>	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 96/08662

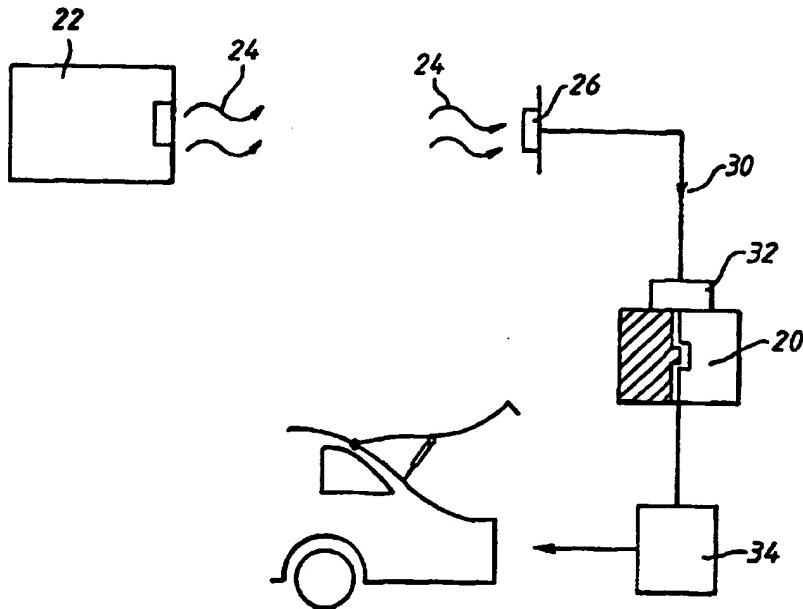
Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 3034061 A		NONE	



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(30) Priority Data: 9512816.1 23 June 1995 (23.06.95) GB		Published <i>With international search report.</i>
(71) Applicant (<i>for all designated States except US</i>): DRAFTEX INDUSTRIES LIMITED [GB/GB]; 11 Glenfinlas Street, Edinburgh EH3 6YY (GB).		
(72) Inventor; and		
(75) Inventor/Applicant (<i>for US only</i>): GALLAS, Gérard [FR/FR]; 46, boulevard des Poilus, F-44300 Nantes (FR).		
(74) Agent: MATHISEN MACARA & CO.; The Coach House, 6-8 Swakeleys Road, Ickenham, Uxbridge, Middlesex UB10 8BZ (GB).		

(54) Title: OPENING ARRANGEMENTS AND METHODS FOR CLOSURE MEMBERS



(57) Abstract

An arrangement and method for remotely unlocking and raising the hatchback (12) of a motor vehicle (10) is described. Firstly, a signal (24) is sent to unlock and unlatch the vehicle hatchback (12). The unlatched hatchback (12) is automatically raised by an amount sufficient to allow gas springs (18) to complete the raising operation. The gas springs (18) may incorporate a device to prevent the hatchback being fully raised.

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OPENING ARRANGEMENTS AND METHODS FOR CLOSURE MEMBERS

The invention relates to a closure opening method, comprising the steps of emitting a signal from a remote location; detecting the signal; and causing an unlatching mechanism to be operated.

The invention further relates to a remotely operable closure opening arrangement, comprising a releasable latching mechanism for latching the closure in the closed position, signal emitting means for emitting an opening signal from a remote location, and detecting means for detecting the signal and releasing the latching mechanism.

Such arrangements and methods are shown in US 4,796,932. In this system, for remotely releasing a motor vehicle compartment panel, a remote release and pull down unit is provided which allows the panel to be unlatched and pulled down enabling the user to unlatch and latch the panel remotely. However, it is desirable to produce a closure opening arrangement in which the panel is opened by a predetermined amount in a controlled fashion.

Accordingly, the known method is characterised by the steps of opening the closure to an initial extent sufficient for a controlled opening mechanism to become operative and causing the closure to be opened by the controlled opening mechanism to a predetermined greater extent.

Furthermore, the known arrangement is characterised by initial opening means responsive to release of the latching mechanism to open the closure to an initial position, and a controlled opening

mechanism operative to open the closure from the initial partially open position to a predetermined greater extent.

Hatchback and luggage compartment opening arrangements, embodying the invention, for use in motor vehicles will now be described, by way of example only, with reference to the accompanying diagrammatic drawings in which:

Figure 1 is a side view of the rear of a motor vehicle showing the hatchback in a closed position;

Figure 2 is a side view of the rear of a motor vehicle showing the hatchback in a fully raised position; and

Figure 3 is a schematic block diagram of the controls of an embodiment of the invention.

The motor vehicle 10 has a hatchback 12 pivotally attached to the body of the vehicle 14 by hinges 16. The hatchback 12 is retained in the closed position by means of a latch and a locking mechanism 20. The latch and locking mechanism 20 can be operated remotely by a portable key device 22 (see Figure 3).

Gas springs 18 (Figure 2, which shows only one of the gas springs) are provided for lifting the hatchback 12 and retaining it in the open position.

To open the hatchback, in accordance with the invention, the operator presses the appropriate button on the separate key device. A suitable signal (such as an infra-red or radio signal) is accordingly emitted by the key device 22 which in turn is

detected by a detector 26. The detector 26 emits a signal on a line 30 that activates a component 32 to unlock the latch mechanism 20.

A spring 34 or any other suitable means then raises the unlatched hatchback 12 slightly and to a level where the gas springs 18 can become operative and raise the hatchback.

The control unit 32 can be part of the central door locking system. However, preferably it can cause the hatchback to open independently of the other vehicle doors.

Additionally, the key device 22 may have other functions such as unlocking the central door locking or arming the vehicle alarm and need not be solely for raising the hatchback.

Furthermore, it will be appreciated that the vehicle need not be a hatchback motor vehicle, and the vehicle part to be opened need not be the hatchback, but could for example be another closure member which is opened by a gas spring or similar means when unlatched, such as the lid of a luggage compartment.

In a modified embodiment of the invention, the gas springs 18 allow the hatchback 12 to be raised only to a certain predetermined intermediate level less than the fully open position. This reduces the risk that the hatchback 12 will be damaged by contacting a low roof or other obstruction. The hatchback can thereafter be caused to rise to the fully open position if desired, by manual force or by further unlatching action.

CLAIMS

1. A closure opening method, comprising the steps of emitting a signal (24) from a remote location; detecting the signal (24); and causing an unlatching mechanism (20) to be operated; characterised by the steps of opening the closure (12) to an initial extent sufficient for a controlled opening mechanism (18) to become operative; and causing the closure (12) to be opened by the controlled opening mechanism (18) to a predetermined greater extent.
2. A method according to claim 1, characterised in that the predetermined extent to which the closure (12) is opened by the controlled opening mechanism (18) is less than the fullest extent of opening.
3. A method according to claim 2, characterised in that the closure (12) can be opened to the fullest extent from the predetermined extent.
4. A remotely operable closure opening arrangement, comprising a releasable latching mechanism (20) for latching the closure in the closed position, signal emitting means (22) for emitting an opening signal (24) from a remote location, and detecting means (26) for detecting the signal (24) and releasing the latching mechanism (20), characterised by initial opening means (34) responsive to release of the latching mechanism (20) to open the closure (12) to an initial position, and a controlled opening mechanism (18) operative to open the closure from the initial partially open position to a predetermined greater extent.

5. An arrangement according to claim 4, characterised in that the predetermined greater extent to which the closure (12) is opened by the controlled opening mechanism (18) is less than the fullest extent of opening.
6. An arrangement according to claim 5, characterised in that the closure (12) can be opened to the fullest extent from the predetermined extent.
7. An arrangement or method according to any preceding claim characterised in that the signal (24) is an infra-red signal.
8. An arrangement or method according to any preceding claim characterised in that the signal (24) is a radio signal.
9. An arrangement or method according to any preceding claim, characterised in that the unlatching mechanism (20) is part of a central door locking system in a motor vehicle (14).
10. An arrangement or method according to any preceding claim, characterised in that the closure (12) is opened to the initial extent by a spring mechanism (34).
11. An arrangement or method according to any preceding claim, characterised in that the initial opening means (34) is an electric actuator.
12. An arrangement or method according to any preceding claim, characterised in that the controlled opening mechanism (18) is a gas spring.

13. An arrangement or method according to any preceding claim, characterised in that the closure (12) is an openable motor vehicle door or lid.
14. An arrangement according to claim 13, characterised in that the door is a hatchback (12).

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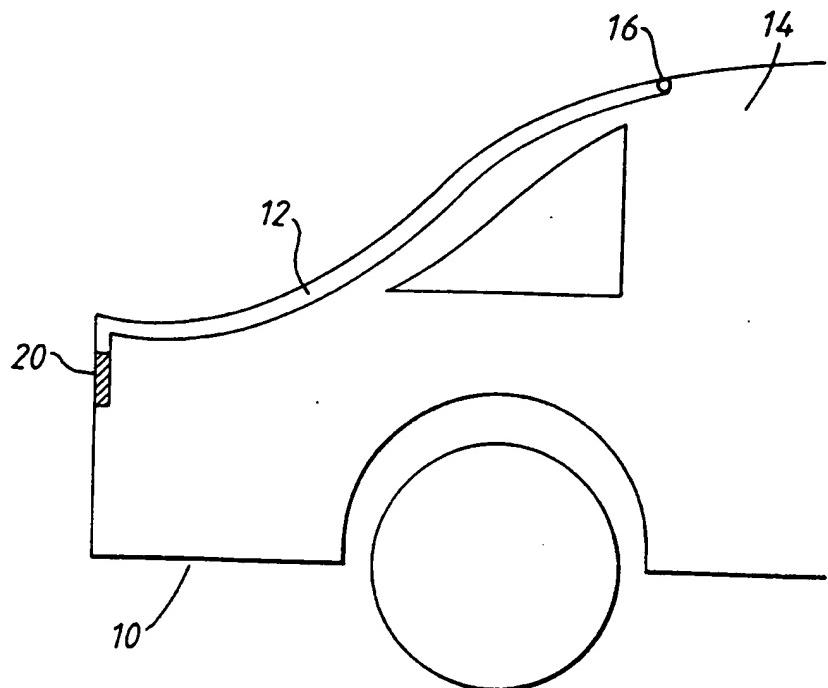


Fig. 1

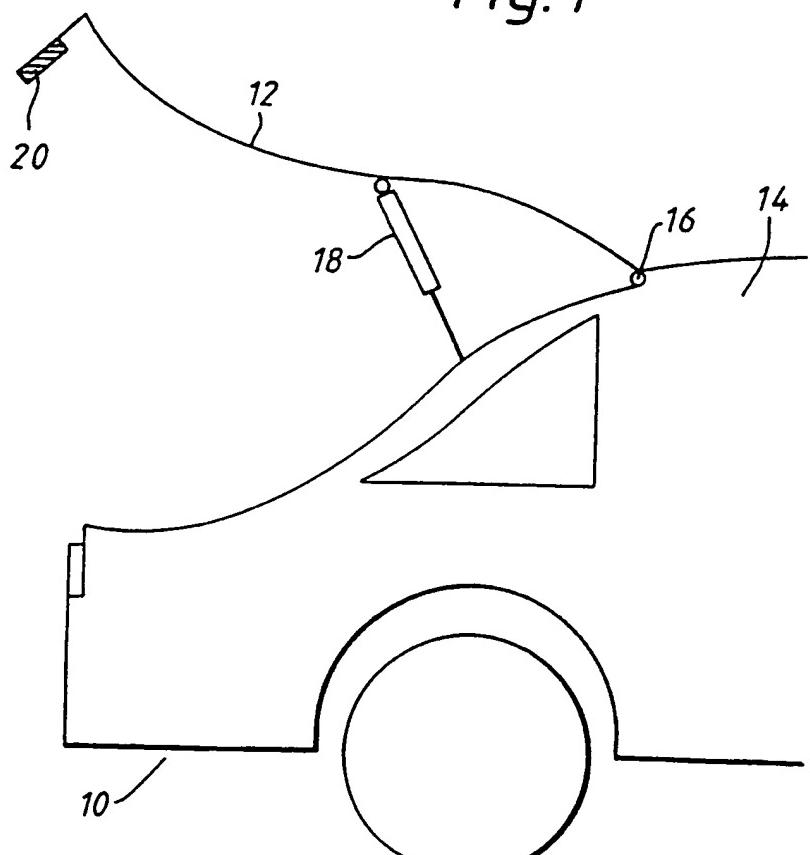


Fig. 2

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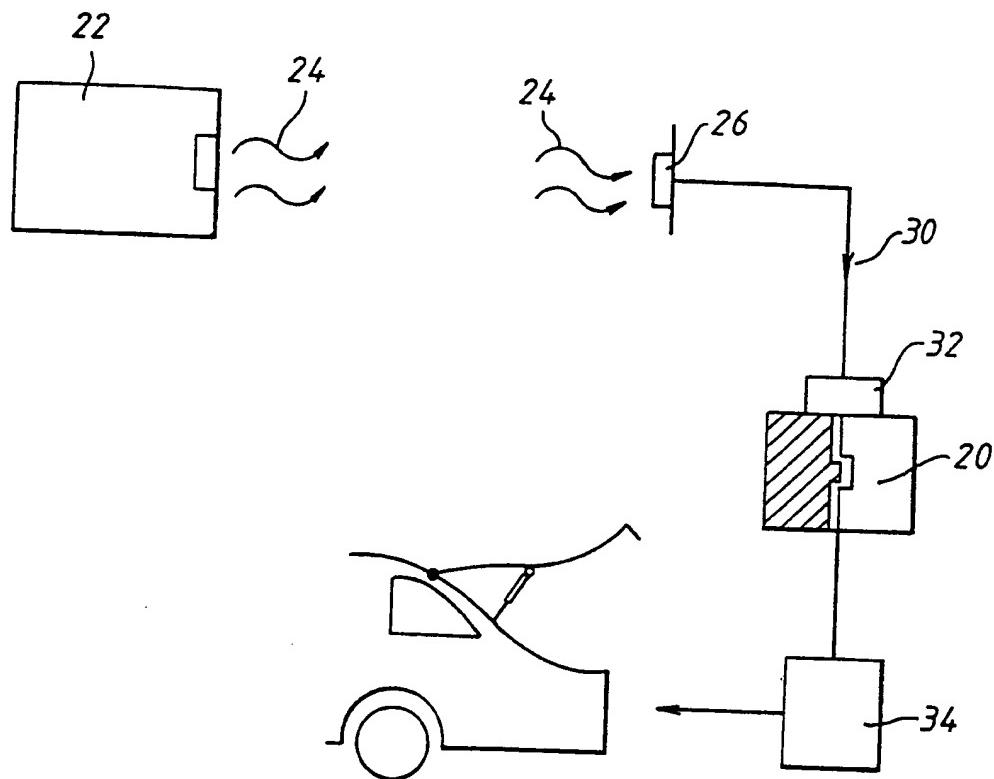


Fig. 3

INTERNATIONAL SEARCH REPORT

In' vnal Application No
PCT/GB 96/01453

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 E05B65/19 E05F1/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 E05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,4 739 585 (PICKLES) 26 April 1988	1,4,10,
Y	see the whole document	11 2,3,5-9, 12
Y	W0,A,92 14018 (AUDI AG) 20 August 1992	2,3,5,6, 12
Y	see the whole document	
Y	DE,A,42 18 798 (MERCEDES BENZ AG) 9 December 1993	7-9
Y	see the whole document	
X	US,A,4 746 153 (COMPEU ET AL.) 24 May 1988	1,4,11
	see the whole document	

	-/-	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

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Date of the actual completion of the international search 6 September 1996	Date of mailing of the international search report 19.09.96
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentstaan 2 NL - 2280 HV Rijswijk Tl. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Authorized officer Westin, K

INTERNATIONAL SEARCH REPORT

Int'l Application No	PCT/GB 96/01453
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,3 835 678 (MEYER ET AL.) 17 September 1974 see the whole document ---	1,4,11
X	US,A,3 081 078 (LOHR) 12 March 1963 see the whole document ---	1,4,11
A	DE,A,43 21 586 (OHI SEISAHUSHO CO., LTD.) 5 January 1994 see the whole document -----	1,4,12

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International Application No

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